RTG SYSTEMS CORPORATION
ELECTRICAL CONSULTING ENGINEERS

Municipal Lighting Report
Town of Markham

Prepared by: **RTG Systems Corporation**
Mr. S. C. Gayowsky, P. Eng.

Date: **June 12, 2007**

3518 Mainway, Suite 203
BURLINGTON ON L7M 1A8
E-Mail: general@rtgsystems.com

Telephone: (905) 335-4470
Alternate: (905) 827-7887
Facsimile: (905) 827-2497

ATTACHMENT "A"

Analysis for Conversion from Higher Wattage to Lower Wattage

Existing Road Classification	Existing pole/luminaire	Existing Spacing	Proposed Action	Sample Area
Laneway	100W Decorative Coach on 4.0m pole	35m or lower	Reduce to 70W	2
Laneway	100W Decorative Coach on 4.0m pole	Greater than 35m	No action recommended	
Laneway	100W Shoebox on 7.6m pole	40m or lower	Reduce to 70W	
Laneway	100W Shoebox on 7.6m pole	Greater than 40m	No action recommended	
Local Residential	100W Cobrahead on 10.7m concrete pole	45m or lower	Reduce wattage to 70W	1,
Local Residential	100W Cobrahead on 10.7m concrete pole	Greater than 45m	No action recommended	
Local Residential	100W Cobrahead on hydro pole		Review based on road width, reduction in wattage is possible.	4
Local Residential	100W Decorative Coach on 7.62m pole	45m or lower	Reduce wattage to 70W	2, 5, 8
Local Residential	100W Decorative Coach on 7.62m pole	Greater than 45m	No action recommended	
Collector Residential	100W Cobrahead on 10.7m concrete pole		No action recommended	
Collector Residential	100W Decorative Coach on 7.62m pole		No action recommended	
Industrial	200W Cobrahead on 12.2m concrete/aluminum pole	50m or lower	Reduce wattage to 150W	9, 10
Industrial	200W Cobrahead on 12.2m concrete/aluminum pole	Greater than 50m	No action recommended	
Arterial	200W Cobrahead on hydro pole or concrete/aluminum pole		No action recommended	11
	250W or higher		If reduction in wattage is desired, a specific study on the area is recommended	
Special Conditions				
Significant Tree Canopies			Tree trimming, re-evaluation of existing lighting after trimming completed.	3,6
Current Lighting not meeting IES Recommended Values			If local residents are not complaining about the existing illumination, we would not recommend additional action be taken. If specific public concerns are raised, a specific study on the area can be performed by the Town's Consultant, with specific recommendations made.	7

Recommended Implementation Strategies

Initially, it was hypothesized that the current lighting levels utilized in the Town of Markham may be generally higher than necessary and that by reducing wattage in the streetlights, significant energy savings could be realized.

Although the results of this study show this to be technically correct, the cost of changing the bulbs and ballasts in existing fixtures (to reduce the wattage utilized) is prohibitively expensive when compared to the energy cost savings that could be achieved.

This is not to say that other actions cannot be taken to mitigate the cost of streetlight energy consumption in the Town of Markham, only that it will take more time to realize the savings than originally anticipated.

The first proposed step in the implementation is for the Town of Markham to revise their Street Lighting Design Standards and list of approved materials, to reflect the heightened impetus on energy efficiency. These revisions should include the following for consideration:

1. **Illumination levels are to be set in accordance with the Recommended Practices of the Illumination Engineering Society of North America (IESNA).**

    - The majority of roadways within the Town of Markham, apart from civic centres, would have anticipated low pedestrian conflict.

    - Wattages to achieve the required light levels would be 70W on most residential roads, with 100W to 150W in residential, industrial and commercial areas as the class of roadways increase (collector roadways). Regional/arterial roadways should remain at 200W or 250W depending on Regional criteria and classification of roadway (York Region currently has levels set in accordance with the IESNA).

2. **The potential mandatory use of Electronic Ballasts in the fixtures.**

    - Should new fixtures installed within the Town of Markham utilize electronic ballasts, energy savings of 20% would be anticipated based on data received from the manufacturer. (these amounts would have to be confirmed and acknowledged by PowerStream in order for the Town to appreciate these savings).

    - The initial cost is anticipated to be higher (up to $150.00 per fixture), although the initial installation is typically supplied and installed by the Development community.

    - Most manufacturers of luminaires used within Markham do not currently offer built-in electronic ballasts (Cooper/American Electric), and as such,

their factory warranties would be voided. It is anticipated that these manufacturers will begin to offer electronic ballasts as part of their offerings as they are currently in negotiations with manufacturers of the ballasts. At this time, we do not have a commitment from the manufacturers as to when we can expect integrated electronic ballasts.

- Until the manufacturers offer built-in electronic ballasts, the cost of retro-fitting ($200.00 plus a voided warranty) will not jusify the savings of approximately $12.00/year (based on a 100W fixture being converted). This would have over a 16 year payback period.

3. **The potential use of "Part Night" Photocontrols for Adaptive Roadway Lighting**

   - Modified photo-controllers can automatically turn off luminaires after a period of use (typically 6 hours).

   - Based on PowerStream's approval, turning off non-essential luminaires (non-intersection luminaires) along roadways in off-peak times (after midnight-1am) would reduce power consumption significantly.

   - At an initial cost of approximately $25.00 per unit, the savings would equate to approximately $21.00/year for 70W fixtures, $29.00/year for 100W fixtures, and $42.00/year for 150W fixtures.

   - This lighting would not be in accordance with current IESNA recommended practices.

   - There could be potential concerns with perceived safety, crime rates, liability to the Town should accidents occur.

4. **The mandatory use of "Dark Sky" friendly street light fixtures.**

   - Although the use of 'Dark Sky' friendly fixtures (reduced direct uplight component from the fixture) will not reduce energy consumption, light trespass continues to be a growing concern for Municipalities.

   - The currently approved fixtures for new subdivisions within Markham are Dark Sky friendly, and any new proposed fixtures should be reviewed with this as one of the criteria.

   - Dark Sky friendly fixtures cannot be substituted in existing subdivisions for non Dark Sky friendly fixtures without an analysis to ensure that satisfactory light levels on the road will be maintained.

5. **The review of new and developing technologies on a recurring basis.**

   - The developments within the lighting industry are occurring quickly and require review by the Town on a regular basis, to enable the Town to benefit from positive developments in the industry.

   - Membership in the IESNA will keep the Town aware of any upcoming conferences, which generally offer the latest information available on new technologies and implementations throughout North America.

   - Attendance at local tradeshows in the GTA area would provide Town staff exposure to new technologies and direct contact with manufacturers representatives. This can be used as a base for developing trials and reviewing/updating standards.

6. **Trials**

   - Any new potential technology should be reviewed on a trial basis in a low impact environment, in real life operating conditions. Brochures and promises from salesman are not as telling as the actual product performing in the actual working conditions.

   - With regard to any product offering energy efficiency, it is recommended that PowerStream be involved by the Town, to ensure that the rates the Town currently pays for energy consumption would be adjusted accurately based on any change to the lighting systems.

The second step in the implementation is to ensure that a proper billing matrix is set up with PowerStream Inc. If PowerStream charges for an energy efficient 70W fixture are the same as a standard 70W fixture, then this initiative will have no affect on the Town's cost. We must, therefore, work with PowerStream to form a tiered matrix where the actual power usage of each fixture is accounted for. This has already been successfully completed in the Traffic Lighting field, where the switch to LED signals had an energy savings impact.

Through the use of these implementation strategies, the Town of Markham Street Lighting System will meet the illumination needs of the various communities while minimizing costs and maximizing energy efficiency.

meco NEWS

Energy saving street lighting project

In 2006, MECO and Asset Management began reviewing various energy conservation projects including opportunities for street lighting which represents the Town's largest electrical use at a cost of approximately $1.4 million per year. The Town was approached by a lighting company with new LED lights for parking lots and street lights. The vendor provided the Town with three 90 watt LED fixtures which they proposed would be comparable to the existing 250 watt high pressure sodium (HPS) fixtures currently used in our Civic Centre parking lot. The lights were installed and evaluated by an independent lighting consultant. The results have been returned and it appears the LEDs produce about the same amount of light per watt as the HPS, thereby not producing the expected energy savings. In addition, the present cost per fixture is more than $3200 versus about $500 for an HPS fixture and do not meet the existing lighting standards at the current pole spacing. The benefits of LEDs at this stage therefore, may be limited to an extended life expectancy which could reduce future maintenance costs and as well, produce an eye pleasing white light. The technology however, is improving in leaps and bounds and may soon be able to compete with other existing technologies in the street lighting area. MECO and Asset Management continue to explore energy efficient lighting options on a regular basis and will monitor the advancement in LED technology for these types of applications.

Old light fixture

New light fixture

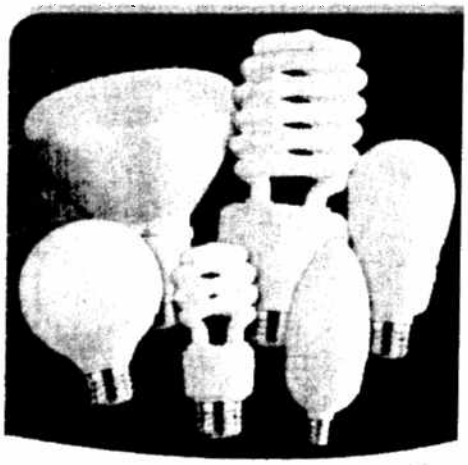
Energy saving in the underground parking garage at the Civic Centre

Another lighting project that was recently completed was the retrofit of the underground parking garage lighting in the Civic Centre. 96 fluorescent lamp fixtures were retrofitted with half the number of light tubes (2 instead of 4 in each fixture) along with Parabolic Reflector Technology (PRT) that ensure that the lighting levels remain the same despite a 50% reduction in the number of lamps. This retrofit will save an annual 25,000 kWh of electricity (the equivalent to powering 31 houses for a month) and 18 tons of carbon dioxide emissions (the equivalent of removing 4 vehicles from the road for a year)!

This project was an internal staff project supported through the Markham Environmental Sustainability Fund (MESF)

Old light fixture

New light fixture (looks like 6 lights)



ATTACHMENT "C"